

## **Environmental Compliance Support for ONR Ocean Acoustics (321OA) At-sea Experiments**

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### **LONG-TERM GOALS**

Providing environmental compliance documentation that is robust and scientifically defensible is the long-term goal of this effort supporting Ocean Acoustics (321OA) at-sea experiments.

### **OBJECTIVES**

The objective of this effort is to conduct thorough analyses of the potential impacts on the marine environment associated with conducting at-sea experiments, including those involving underwater acoustic transmissions, and to prepare the requisite environmental documentation that are compliant with applicable Federal and state statutes and with Navy (OPNAVINST 5090.1C) and ONR Ocean Battlespace Sensing policies.

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## **APPROACH**

For each of the planned at-sea experiments, MAI marine biologists, acousticians, and analysts work closely with the experimental team to acquire the information and data necessary to completely understand the experiment's objectives, specific design metrics, and characteristics of any active acoustic sources deployed during the experiment. After carefully reviewing the scientific literature, marine biologists confirm the protected marine species occurring in the experimental locale and compile or derive densities for the appropriate season. MAI acousticians and analysts use the densities with the propagation characteristics of the acoustic source and animal movement information, derived using the Acoustic Integration Model (AIM) or other ONR-approved calculation methodologies, to calculate or model sound exposure levels for individual marine animals and estimate the potential impacts given the appropriate acoustic threshold criteria.

## **WORK COMPLETED**

The completion of thorough impact analyses and appropriate environmental compliance documents by MAI enabled ONR to authorize the following Ocean Acoustics at-sea experiments to be conducted during the last fiscal year:

- **RACE08 (Rescheduled Acoustic Communications Experiment–2008):** Concurrence to conduct the experiment was also gained from the Rhode Island Coastal Zone Management Program. A team of scientists from Woods Hole Oceanographic Institution, Scripps Institution of Oceanography, the Graduate School of Oceanography at the University of Rhode Island, and the Canadian Institute of Ocean Sciences conducted the experiment in the late winter to early spring of 2008 in Narragansett Bay, Rhode Island. The purpose of the experiment was to collect data on the generation and evolution of surface bubbles, roughness, and internal turbulence as well as to investigate the impact of these processes on the propagation of high frequency acoustic signals.
- **KAM08 (Kauai Acoustic Communications MURI–2008) Experiment:** Scientists from Scripps Institution of Oceanography and the University of Delaware to conduct a basic research experiment on the Navy Pacific Missile Range Facility in summer of 2008. The objective of the experiment was to collect acoustic and environmental data appropriate for studying the coupling of oceanography, acoustics, and underwater communications.
- **SPACE08 (Surface Processes and Acoustic Communications Experiment–2008):** Concurrence from the Massachusetts Coastal Zone Management Program was also gained to conduct this experiment in late summer to early fall of 2008. The purpose of the experiment was to record and measure data on bubble formation, which will enable scientists to understand more about the effects of bubbles on the propagation of high frequency sound in shallow water marine environments. Researchers from Woods Hole Oceanographic Institution, the Graduate School of Oceanography at the University of Rhode Island, Scripps Institution of Oceanography, and the Canadian Institute of Ocean Sciences designed and conducted this experiment in the waters of the Martha's Vineyard Coastal Observatory.
- **QPEU08 (Quantifying, Predicting, and Exploiting Uncertainty 2008) Pilot Experiment:** The first experiment in the at-sea research collaborative program between Taiwanese and U.S. scientists, universities, and organizations began during early September 2008. The goal of the Pilot

Experiment is to test equipment and gather baseline oceanographic, acoustic, and geologic measurements. A U.S. mobile experimental acoustic source and oceanographic equipment were deployed from a Taiwanese research vessel during the experiment. The overall goal of the joint initiative is to collect, assimilate, and model acoustic and oceanographic data from the East China and Philippine Seas with the ultimate goal of improving acoustic prediction and reducing environmental modeling uncertainties.

## **RESULTS**

MAI facilitated the ability of ONR Ocean Acoustics to conduct four at-sea experiments and support the department's ongoing scientific research mission by providing robust and rigorously detailed environmental documents prepared in accordance with Navy (CNO) and ONR guidelines and that comply with the regulatory and legislative requirements to thoroughly analyze potential impacts to the marine environment.

## **IMPACT/APPLICATIONS**

The environmental analyses and associated compliance documents that were produced for four at-sea experiments were required by U.S. Federal and state statutes. Compliance with the regulatory requirements allowed ONR to conduct four important experiments and collect valuable oceanographic and acoustic data that may help resolve perplexing issues and lead to the development of improved acoustic systems.

## **TRANSITIONS**

N/A. The results of this effort enable experimentation and testing to continue.

## **RELATED PROJECTS**

The QPEU08 Pilot Experiment collected baseline data and information that will be utilized in a larger scale, joint Taiwan/U.S. experiment to be conducted in 2009. MAI is prepared to conduct the impact analyses for this upcoming experiment and prepare the associated environmental compliance document.

## **REFERENCES**

N/A

## **PUBLICATIONS**

*Acoustic Impact Analysis for the Quantifying, Predicting, and Exploiting (QPE) Uncertainty 2008 Pilot Experiment*, Final Technical Report, August 2008.

*Acoustic Impact Analysis for the Surface Processes and Acoustic Communications Experiment–2008*, Final Technical Report, August 2008.

*Enclosure 1, Additional Information on the KAM08 Experiment*; Final Technical Report, May 2008.

*Acoustic Impact Analysis for the Rescheduled Acoustic Communications Experiment–2008*, Final Technical Report, February 2008.